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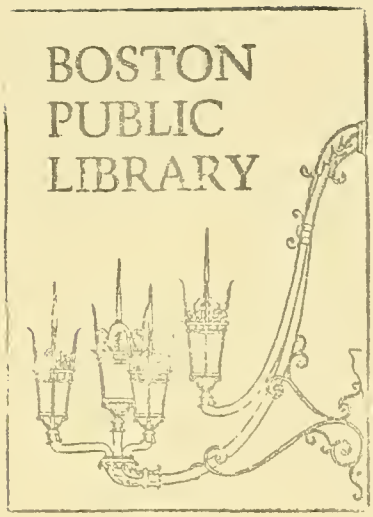
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Dorchester

SEISMIC REFRACTION INVESTIGATIONS

DORCHESTER BAY

prepared for

BOSTON REDEVELOPMENT AUTHORITY

WESTON GEOPHYSICAL ENGINEERS, INC.
WESTON, MASSACHUSETTS

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WESTON GEOPHYSICAL ENGINEERS, INC.
POST OFFICE BOX 306
WESTON, MASSACHUSETTS 02193
AREA CODE 617 899-0060

May 9, 1969

Boston Redevelopment Authority
Urban Redevelopment - 9th Floor
1 City Hall Square
Boston, Massachusetts 02201

Gentlemen:

Seismic refraction surveys were performed in the Dorchester Bay Area in accordance with your Contract Number 69-7, dated February 3, 1969.

Preliminary results in the form of a generalized bedrock contour map were previously submitted; this is a formal presentation of our findings.

Sincerely yours,

WESTON GEOPHYSICAL ENGINEERS, INC.

Vincent J. Murphy
Vice President

VJM:jh

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SEISMIC REFRACTION INVESTIGATIONS

DORCHESTER BAY

INTRODUCTION

A seismic survey was conducted in the Dorchester Bay - Thompson Island Area of Boston Harbor for the Boston Redevelopment Authority. The field investigations took place during the months of February, March and April 1969.

Although data collection was completed within the prescribed number of work days, the time assigned for completion had to be doubled because of adverse weather conditions.

The seismic refraction technique was used for this study. The instrumentation used was a twelve trace seismograph with photographic recordings. Seismic energy was generated with explosives placed on the Harbor bottom. Seismic detectors were pressure sensitive transducers which were attached to a marine recording cable and suspended about 10 feet below the surface. This geophone array was towed throughout the area of investigation and shots were detonated at the leading end of the array.

Each shot was located from three transit stations on shore. Since accurate locations depended on the proper positioning of the triangulating

stations with respect to shot points, a number of transit stations were established throughout the area.

Since the elevation of the floating recording cable was controlled by the height of the tide, tide gauge readings were taken during each recording period so that appropriate tidal corrections could be made.

This survey was planned to provide subsurface information along lines approximately 1,000 feet apart throughout the area of interest.

PURPOSE

Since either bedrock or till will provide suitable foundation conditions for the proposed project, the purpose of this survey was to establish depths to bedrock and to delineate seismic velocity discontinuities above bedrock so that areas of dense glacial till could be located.

In general, seismic velocities correspond to the geologic materials in a given area. Saturated materials within the water table have a velocity range of 4,800 to 5,300 ft./sec. Materials in this range are difficult to identify because they are masked by the water velocity which is approximately 5,000 ft./sec. Seismic velocities above 5,300 ft./sec. are usually dependent upon elastic moduli with saturation having very little effect.

The dense glacial tills of Boston Harbor have seismic velocities in the range of 5,500 to 7,000 ft./sec., while mud or clay velocities are in a lower range of 4,800 to 5,100 ft./sec. Therefore, the tills are distinguishable in most cases, provided they are of sufficient thickness. Seismic velocities above 10,000 ft./sec. are indicative of sound bedrock.

RESULTS

The results of this survey are shown on the profile sections included in this report. The locations of these profiles and recommended borings, with order of boring priority indicated, are shown on the plan map of this report.

The seismic profile sections are typical sections; that is, their construction was based on seismic information collected along the profile as well as information collected between the profile sections. These results are based on more than 600 seismic recordings.

DISCUSSION OF RESULTS

The velocity range of 5,500 to 7,000 ft./sec. in this area is believed to be that of dense, compact glacial till.

The velocities of 13,000 to 14,000 ft./sec. are indicative of hard bedrock with possible,very localized chemical or mechanical weathering.

In the area to the southwest of Thompson Island there appears to be dense till at or just below the Harbor bottom. From Station 00+00 to Station 13+00 on Profile E, this material ranges from 0 to 50 feet in depth. A boring is recommended in this area to determine if this material is dense and also to check the shallow depths to bedrock near Station 00+00 on Profile A.

On Profile J between Stations 24+00 and 28+00 the rock is quite shallow and may exist at the Harbor bottom. A boring is recommended here to check this shallow area.

On Profile B at approximately Station 48+00 a velocity of 5,500 ft./sec. was recorded on a few shots. Although the bedrock is very deep, there is a slight possibility of dense material existing at a higher elevation.

In Area 1A the results of this survey were seriously affected by organic materials on the bottom. The energy created by the explosive charges is absorbed by these materials resulting in very poor record quality. Also, work was hampered by boat moorings in the northwest corner of this area. For these reasons, limited results are shown for Area 1A. A boring designated as Number 4 is recommended to check the possible existence of glacial till in the southern part of this area.

In Area 2 the seismic results were good. The material in this area is, for the most part, thought to be glacial till and exists at or just below

bottom. On Profile 2 at Station 00+00 the rock is dashed because of limited data.

On Profile 3 the high velocity material (6,000 ft./sec.) ranges from over 50 feet deep at Station 00+00 to about 15 to 20 feet deep at the higher stations. This corresponds well with the trends of this material on the southwest side of Thompson Island. Borings are recommended here to check the depths to the high velocity material which is thought to be glacial till.

A copy of the Record Plan of the Dorchester Bay Outfall Sewer Tunnel is included in this report. It should be noted that the bedrock surface is based on boring refusals with the probable exceptions at the shaft locations. This is included to provide information in an area which was excluded from this survey because of the potential danger to the existing brick-lined tunnel.

ACKNOWLEDGEMENTS

We wish to express our appreciation to: the Authorities of Thompson Academy for their cooperation in permitting us to establish survey control points on their land and for their generous offer of shelter for the field parties; Commissioner Howard Whitmore, Jr., Metropolitan District Commission for expediting permission to use Kelly's Landing for the loading of explosives; Commissioner Joseph F. Casazza, Public Works Department, City of Boston for providing a copy of the Record Plan of the Dorchester Bay Outfall Sewer Tunnel; Mr. Joseph Sainato, Jr. of the State Fire Marshall's Office for his assistance in resolving jurisdictional matters involved in the use of explosives in areas of both State and Federal control.

We are grateful to the following for providing information concerning buried structures and/or utilities in the area of investigation:

Boston Edison Company

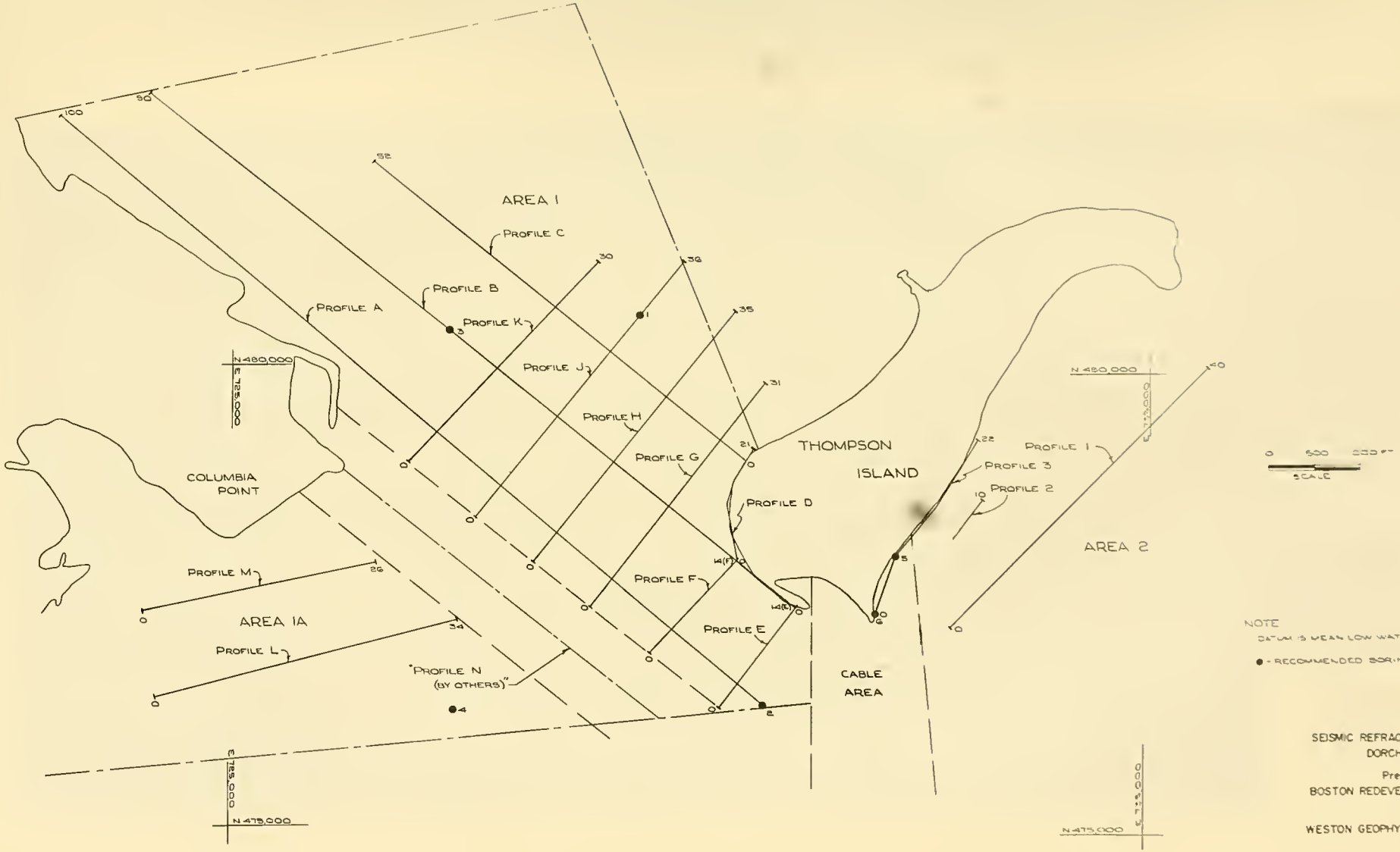
Boston Gas

City of Boston, Department of Public Works

Massachusetts Port Authority

Metropolitan District Commission
Sewerage Division
Water Division

New England Telephone and Telegraph Company



SEISMIC REFRACTION INVESTIGATIONS
DORCHESTER BAY

Prepared for
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SCALE AS SHOWN

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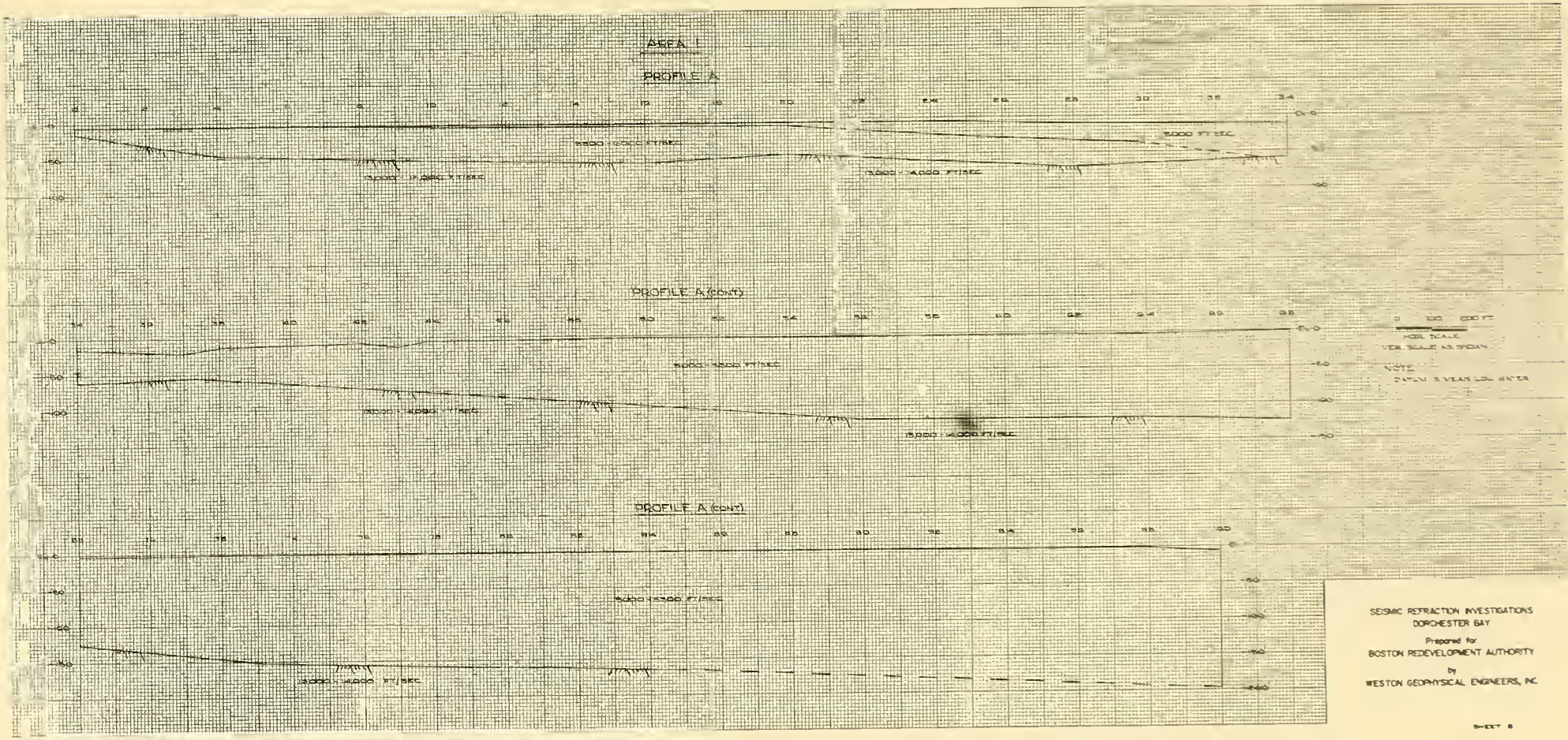
AREA I
PROFILE A
PROFILE A (CONT)
PROFILE A (CONT)
5000 - 15500 FT/SEC
5000 FT/SEC
4000 FT/SEC
5000 - 15000 FT/SEC
15000 - 16000 FT/SEC
5000 - 15500 FT/SEC
3000 - 4000 FT/SEC
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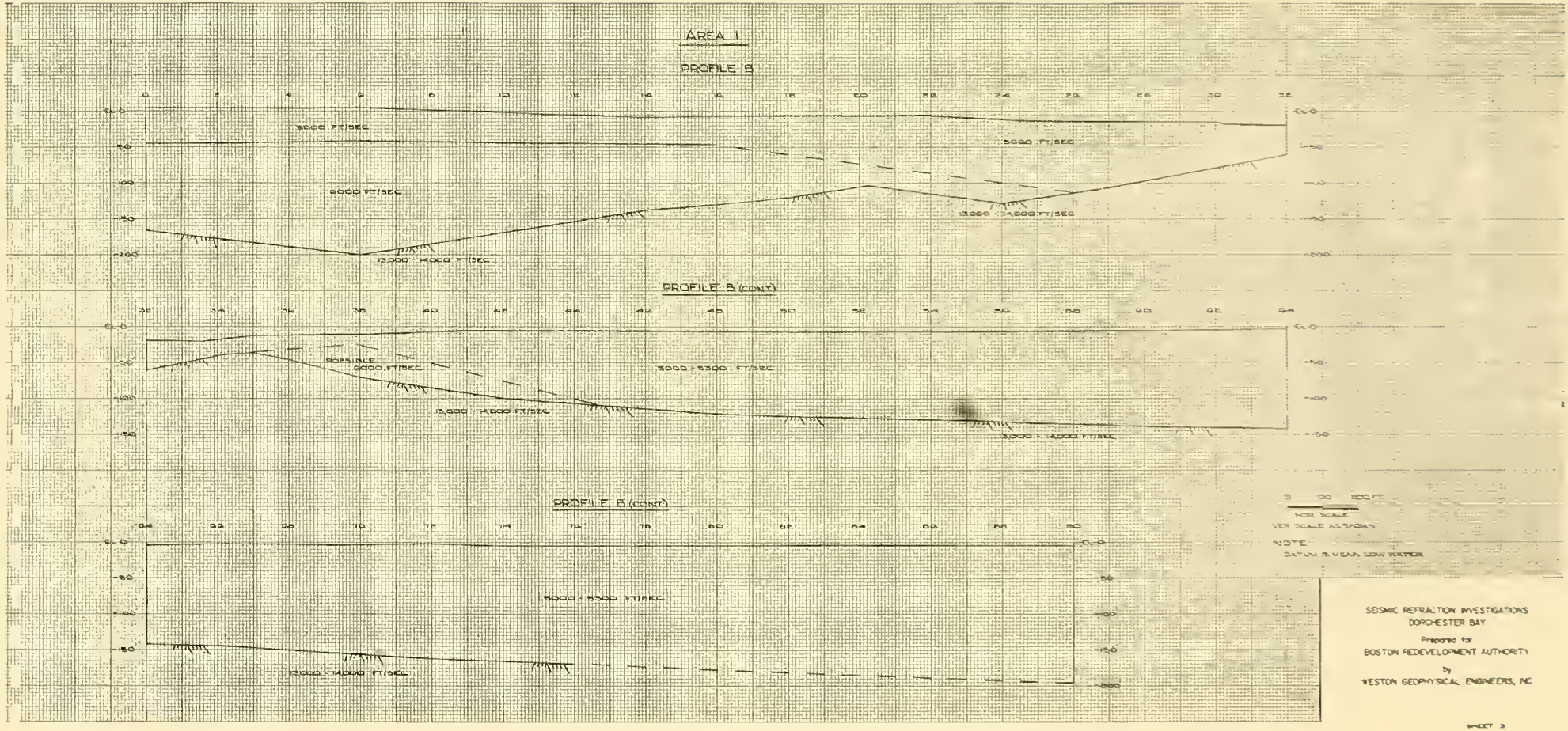
SHEET 8



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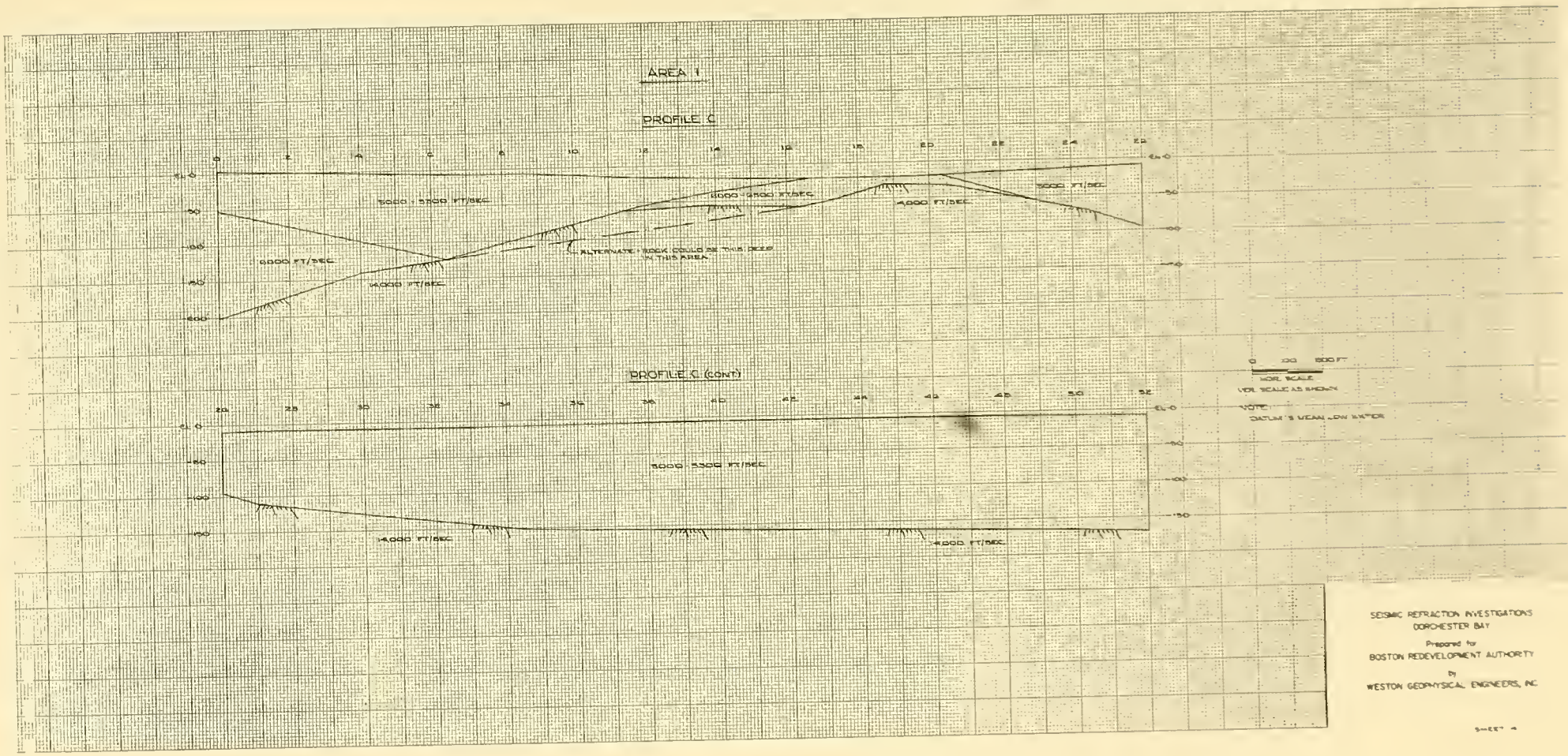

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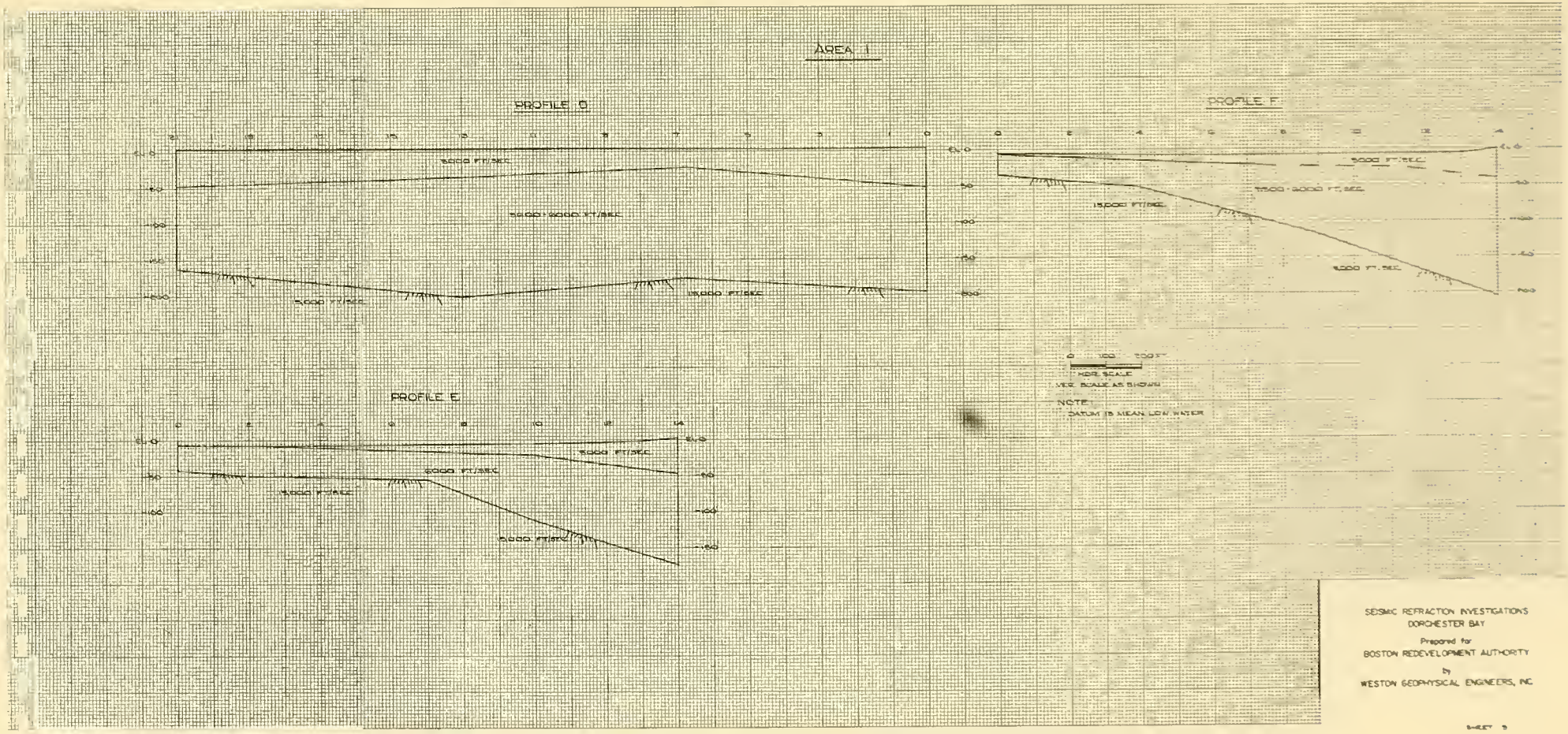

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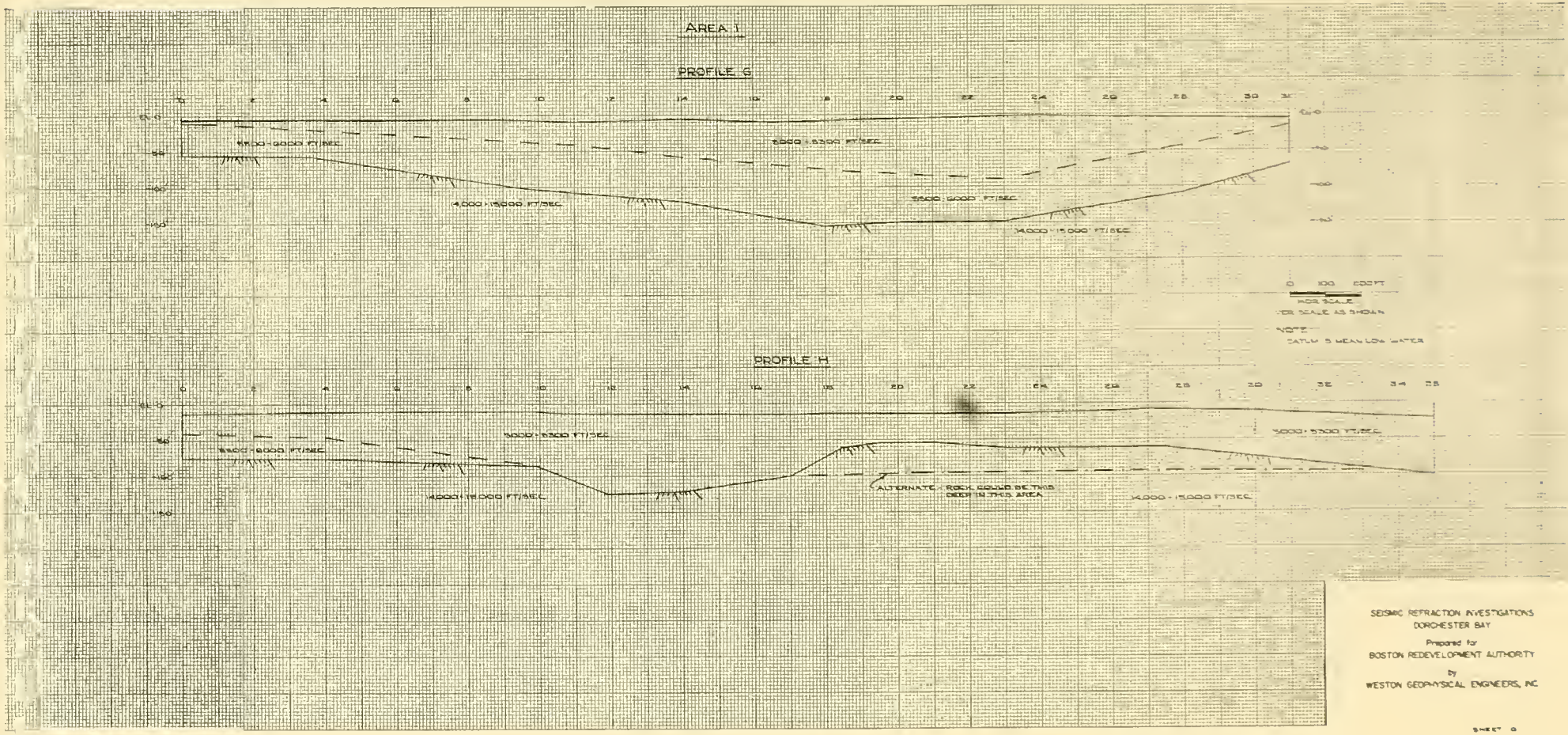

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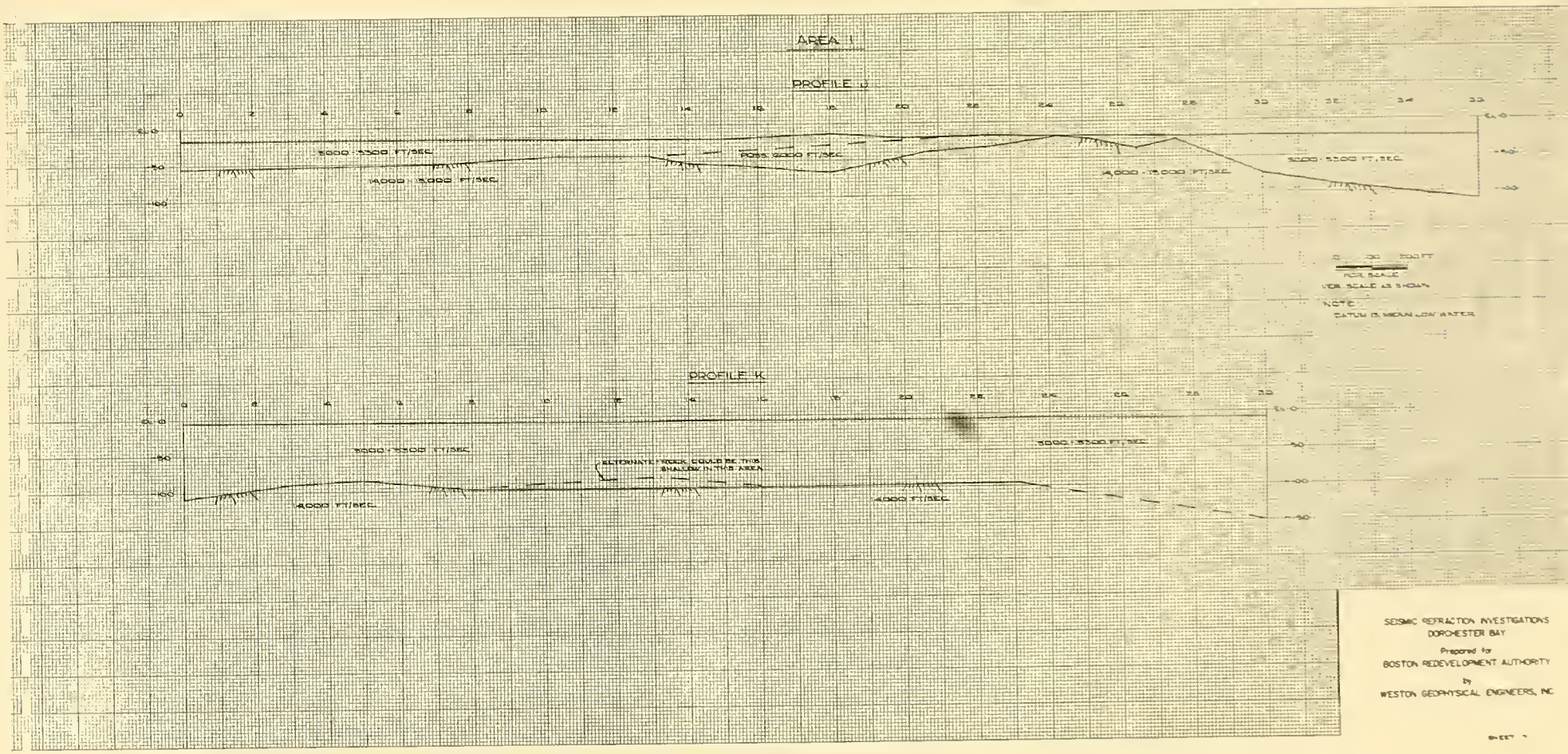
AREA 1
PROFILE J
5000 - 7500 FT/SEC
14000 - 15000 FT/SEC
POSS 12000 FT/SEC
4000 - 5000 FT/SEC
5200 - 5500 FT/SEC
EL 0
-50
-100
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36
0 30 200 FT
HOR SCALE
VERT SCALE AS SHOWN
NOTE
DATUM IS MEAN LOW WATER
PROFILE K
5000 - 5500 FT/SEC
ALTERNATE ROCK COULD BE THIS SHALLOW IN THIS AREA
4000 FT/SEC
5000 - 5500 FT/SEC
EL 0
-50
-100
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

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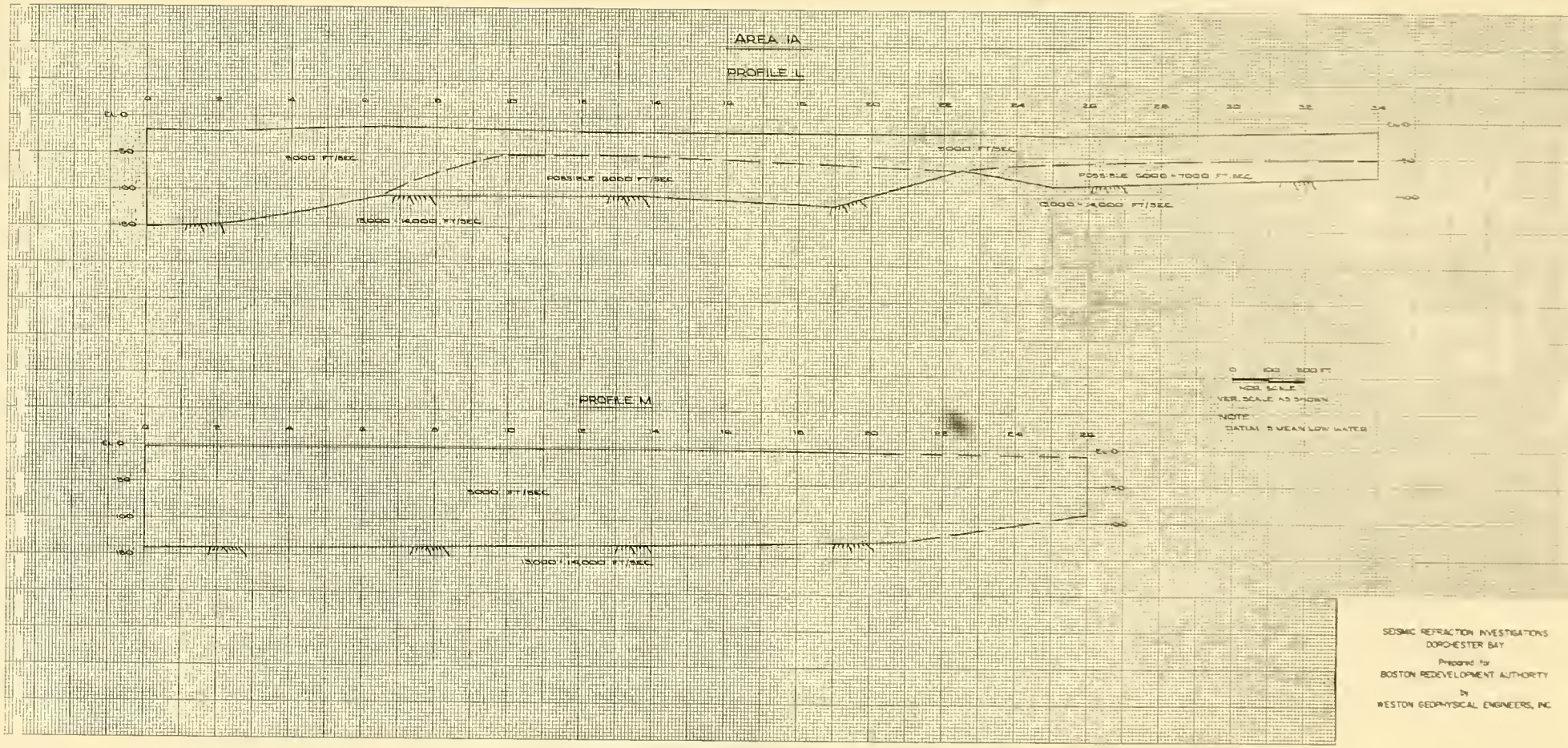

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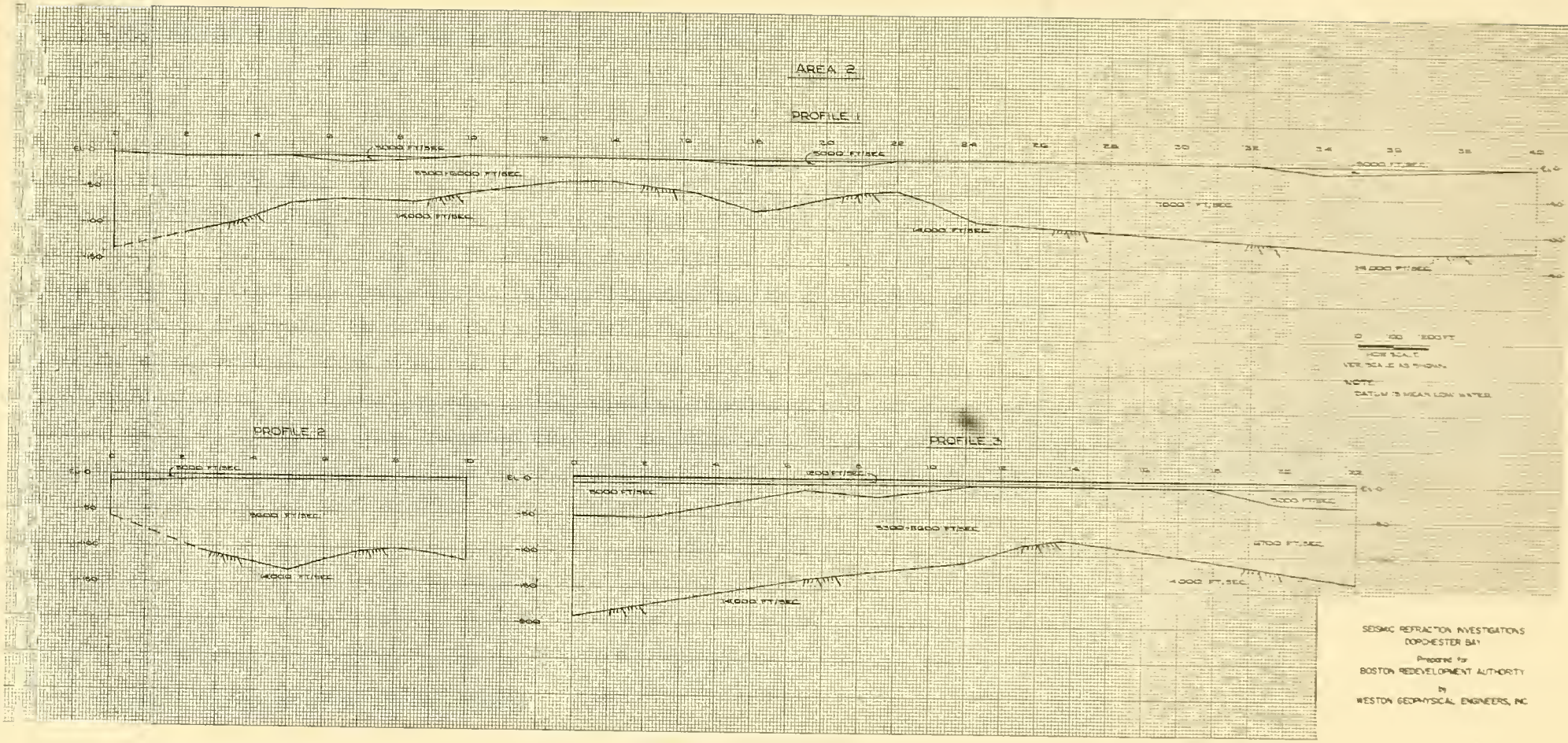

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SHEET 9

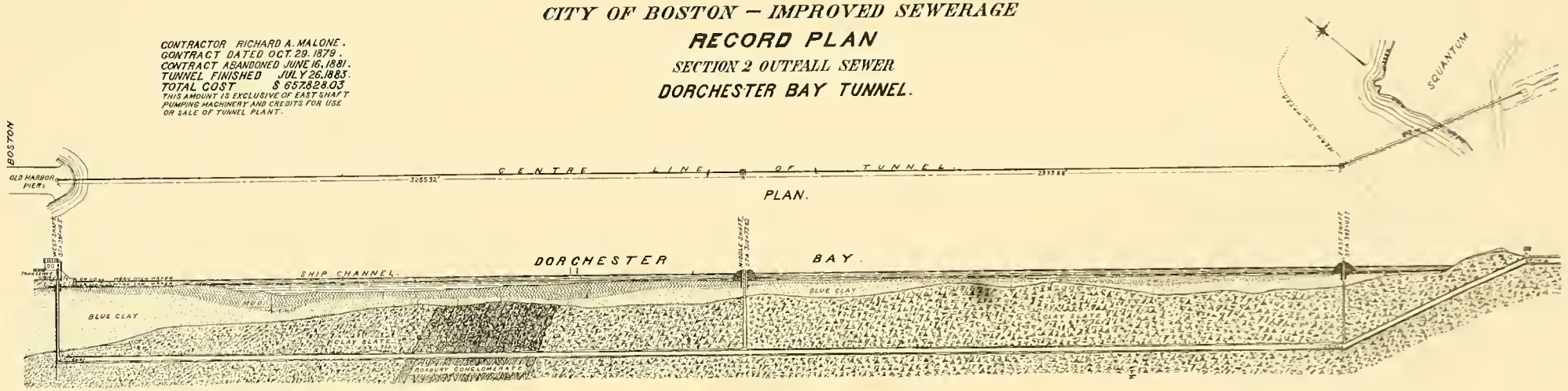
CITY OF BOSTON — IMPROVED SEWERAGE

RECORD PLAN

SECTION 2 OUTFALL SEWER

DORCHESTER BAY TUNNEL.

CONTRACTOR RICHARD A. MALONE.
CONTRACT DATED OCT. 29. 1879.
CONTRACT ABANDONED JUNE 16, 1881.
TUNNEL FINISHED JULY 26, 1883.
TOTAL COST $ 657.828.03
THIS AMOUNT IS EXCLUSIVE OF EAST SHAFT PUMPING MACHINERY AND CREDITS FOR USE OR SALE OF TUNNEL PLANT.



0 500 000 FT
SCALE

NOTES
DATUM IS MEAN LOW WATER
—— - INDICATES QUESTIONABLE DATA
CONTOUR INTERVAL IS 20'

GENERALIZED BEDROCK CONTOUR MAP

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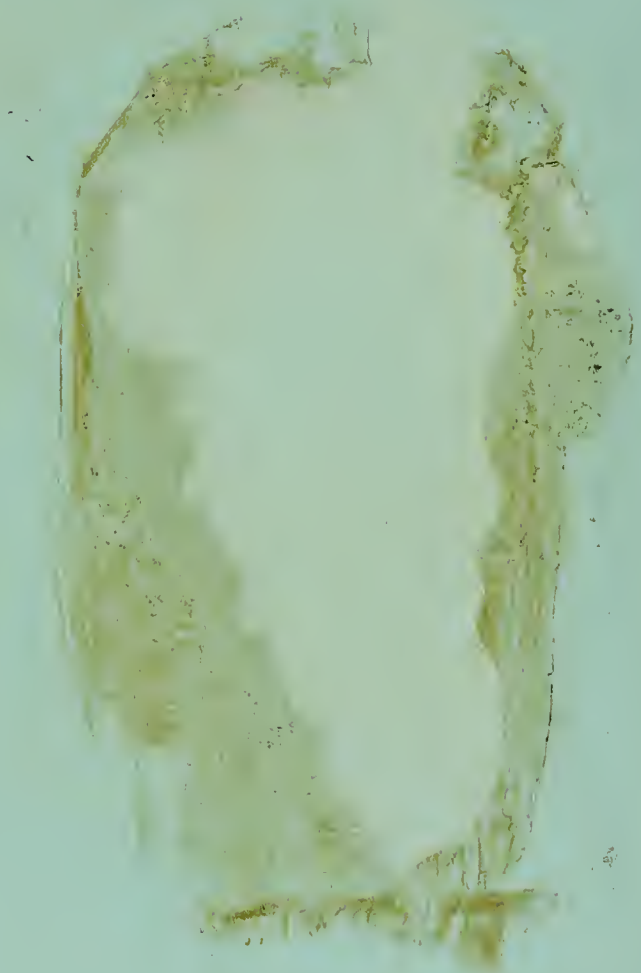
SHEET

024 12

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Seismic refraction investiga-
tions; Dorchester Bay.